PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-256500

(43)Date of publication of application : 11.09.2002

(51)Int.Cl. C25D 17/20
C25D 21/00

(21)Application number : 2001-051495

(22)Date of filing : 27.02.2001

(71)Applicant : BEITEKKU JAPAN:KK

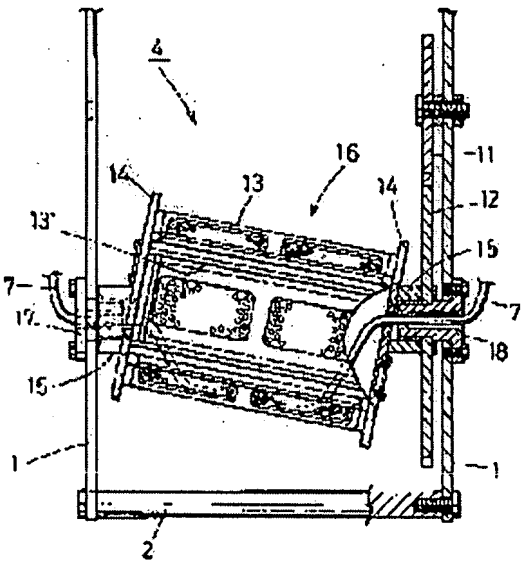
(72)Inventor : DAIWAN TAKASHI

(54) BARREL PLATING EQUIPMENT

(57)Abstract:

PROBLEM TO BE SOLVED: To provide barrel plating equipment which effectively prevents contamination of a plating liquid due to damage of a lead wire and has high productivity.

SOLUTION: The barrel plating equipment comprises a barrel which is rotatably supported at both ends by support members via two support axes, a hole at the barrel side for inserting a lead wire therein, which is formed in the barrel, and a hole at the support axis side for inserting the lead wire therein, which communicates with the hole at the barrel side and is formed in the support axis. The size of an open part at the barrel side of the hole at the support axis side is to fit the lead wire. The hole on the barrel side comprises facing to the hole at the support axis side, and has a larger diameter than the open part at the barrel side of the hole at the support axis side, which prevents inflow of workpieces when the lead wire is inserted through the hole at the barrel side.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the barrel plating equipment for performing plating processing to work pieces, such as for example, a microchip capacitor.
[0002]
[Description of the Prior Art] Conventional barrel-plating equipment Y fixes in the barrel container B of the shape of hollow made of synthetic resin and the barrel container B loaded with a work piece, as shown in drawing 5 , equips the interior with the supporter material which supports the barrel A which consists of lead-wire supporter material F made of synthetic resin which has the insertion hole D which enabled insertion of lead-wire R, and this barrel A free [rotation] focusing on axis of rotation (a) and which does not illustrate, and is constituted. The lead-wire supporter material F consists of wrap caps F2 in the point of the boss F1 who changes fitting into the condition of having projected inside barrel container B from the outside of the barrel container B, and the boss F1 formed in the shape of [which has a taper side] a cone while the core of the insertion hole D is located on the axis of rotation (a) of the barrel container B. The front face is covered with rubber or resin, and lead-wire R is inserted in the interior of the barrel container B through the insertion hole D from the exterior of Barrel A. And by rotating the whole barrel A, the work piece contained in Barrel A connects with the cathode lateral electrode of lead-wire R electrically, and is plated. At this time, lead-wire R inserted in the insertion hole D is interlocked with rotation of a barrel.
[0003]
[Problem(s) to be Solved by the Invention] by the way, in order to rotate the whole barrel A in the condition of having made lead-wire R inserting in the insertion hole D Although a clearance must be prepared between the outer diameter of lead-wire R, and the bore of the insertion hole D, when a work piece is a minute thing smaller than a clearance like for example, a microchip capacitor A work piece enters this clearance and there is fault that neither the internal surface of the insertion hole D nor the covering section of lead-wire R is damaged, or smooth rotation of Barrel A may be blocked and good plating cannot be performed. On the other hand, if a ****** clearance is not prepared between the outer diameter of lead-wire R, and the bore of the insertion hole D so that a work piece may not enter this clearance, there is fault that the covering section of lead-wire R rubs against the internal surface of the insertion hole D, and is damaged with rotation of Barrel A. And when the covering section of lead wire is damaged, there is fault that it will be eluted by the amount of [of the lead wire exposed by breakage] copper section in plating liquid, and it will soil plating liquid. Furthermore, there is also fault of requiring immense cost and time and effort in exchange of unclean plating liquid. Moreover, since the lead-wire supporter material F is in the condition of having projected inside the barrel container B with cap F2 and the part which uniform plating may not be able to make [part / a work piece] it be easy to adhere to a trough, and made the cap F2 project, and the volume become small, quantity of the work piece which can be held in the interior of the barrel container B cannot fully be secured, but the fault of being bad also has productive efficiency.
[0004] This invention aims at offer of barrel plating equipment with high productivity while it is proposed in view of the above-mentioned trouble and prevents effectively contamination of the plating liquid by breakage of lead wire.
[0005]
[Means for Solving the Problem] In order to attain the above purpose, the barrel plating equipment of this invention While having the barrel of the shape of hollow loaded with a work piece, and supporter material equipped with two support shafts and supporting a barrel pivotable to supporter material in the state of both-ends support through two support shafts The barrel side insertion hole for making a barrel insert in the lead wire arranged between a way and the inside of a barrel outside a barrel is formed. It is open for free passage to said barrel side insertion hole, and the support

shaft side insertion hole for making the lead wire arranged between a way and the inside of a barrel outside a barrel insert in is formed in a support shaft. While making magnitude of the open section by the side of the method of the inside of a barrel in a support shaft side insertion hole into the magnitude stuck to lead wire and making a barrel side insertion hole counter a support shaft side insertion hole From the open section by the side of the method [in / for the magnitude of a barrel side insertion hole / a support shaft side insertion hole] of the inside of a barrel, by the major diameter, when lead wire is made to insert in a barrel side insertion hole, it is considering as the magnitude which prevents the inflow of a work piece. Moreover, while a barrel is equipped with the barrel and the bearing which it has a barrel side insertion hole, and both-ends opening of said barrel is prepared by a wrap side plate and this side plate, and receives a support shaft pivotable and forms the inside of said side plate in a flat surface, a protrusion inhibition means to prevent that a support shaft projects in the method of the inside of a barrel from the inside of the side plate of a barrel may be established between a barrel and a support shaft. Furthermore, it has a body of a side plate, and a barrel side insertion hole, and the side plate of a barrel is formed with the quality of the material with coefficient of friction smaller than the quality of the material of the body of a side plate, and may be equipped with the lead-wire insertion member attached in the body of a side plate removable.

[0006] In addition, when work pieces are even and light things, such as for example, a microchip capacitor, a work piece sticks mutually and the variation in plating nonuniformity or thickness tends to become large. Therefore, it is desirable to prepare in the condition of having made 10 degrees - 12 degrees of center lines of the barrel of a barrel inclining in the vertical direction to a horizontal plane, and to raise the stirring effectiveness. Furthermore, 11 degrees, then better plating can be performed for whenever [tilt-angle / of a barrel].

[0007]

[Embodiment of the Invention] Below, the barrel plating equipment X of the operation gestalt of this invention is explained at a detail.

[0008] Drawing 1 is the perspective view of the barrel plating equipment X of this operation gestalt. Drawing 2 is the fragmentary sectional view of barrel plating equipment X.

[0009] Fundamentally, the barrel plating equipment X of this operation gestalt is equipped with the multiple tubed barrel 4, the supporter material 3 which supports a barrel 4 pivotable, the driving gear 8 attached in the supporter material 3, and the transmission 5 which transmits the power of a driving gear 8 to a barrel 4, as shown in drawing 1 and drawing 2 . And it is fixed to the support plate 1 made from the acrylic of a right-and-left pair, and a support plate 1 by one, and the supporter material 3 consists of support shafts 17 and 18 made from super-high density polyethylene which support the shaft-orientations both-ends side of a barrel free [rotation], and a connection member 2 made from an acrylic which connects support plate 1 comrades. In addition, this barrel plating equipment X is made immersed in a plating bath, and is used.

[0010] The barrel 13 by which a barrel 4 was formed in abbreviation hexagon-head tubed combining the perforated plate which prepared the hole of a large number which make plating liquid penetrate as shown in drawing 2 , It has composition equipped with the bearing device 15 as a bearing prepared in the barrel body 16 which consists of a body 14 of a wrap side plate, and both bodies 14 of a side plate in both-ends opening of this barrel 13, and is formed with acrylic resin except [all] the member specified especially. Moreover, a barrel 4 is attached in the supporter material 3 so that the center line prolonged in the shaft orientations of a barrel 13 may be in the condition that 11 degrees inclined to the horizontal plane. Furthermore, a closedown is carried out to a barrel 13 with a lid (not shown), and the receipt opening 131 take a work piece in and out of which is formed in it.

[0011] As shown in drawing 3 and drawing 4 , the bearing device 15 consists of the boss sections 20 and 21 of the shape of the square pole by which the through tube 201,211 was formed in the interior, and a bearing 22 made from super-high density polyethylene pasted up on the wall of a through tube 201,211, and joining is carried out to the body 14 of a side plate, and it is prepared in the barrel body 16 at one. In addition, in order to attach the barrel body 16 in the condition of carrying out the predetermined include-angle inclination at the supporter material 3, the boss sections 20 and 21 carry out the predetermined include-angle inclination of the center line to the body 14 of a side plate, and are prepared.

[0012] The free passage hole 141 which is open for free passage in a through tube 201,211 is formed in the body 14 of a side plate, and the bush 23 made from super-high density polyethylene which equipped this free passage hole 141 with the barrel side insertion hole 231 is attached. a bush 23 -- the thickness of the body 14 of a side plate, and abbreviation -- it is disc-like [of the same thickness], and in order to prevent the omission to the method of outside at the time of installation, the path by the side of the inside 140 of the body 14 of a side plate is formed in the major diameter. And fitting is carried out removable from the way side among the barrel bodies 16 so that it may become the inside 140 of the body 14 of a side plate, and abbreviation flush. In addition, the barrel side insertion hole 231 is

formed in the location which counters the lead-wire insertion hole 174,184 prepared in the support shafts 17 and 18 which carry out a postscript, and when it is a major diameter and lead wire 7 is made to insert in rather than the insertion hole narrow diameter portion 175,185 as the open section by the side of the method of the inside of the barrel 4 in the lead-wire insertion hole 174,184, it is formed in the slightly larger path than the outer diameter of lead wire 7 so that the inflow of a work piece may be prevented.

[0013] The support shafts 17 and 18 of the supporter material 3 consist of a narrow diameter portion 172,182 inserted in the bearing 22 of the bearing device 15, and a flange 173,183 attached in the major diameter 171,181 as a protrusion inhibition means of a major diameter, and the support plate 1 of the supporter material 3 by the narrow diameter portion 172,182 with a bolt 19. In addition, only the thickness of the barrel gear 12 which carries out the postscript of the shaft-orientations die length of the narrow diameter portion 182 of one support shaft 18 rather than the die length of the narrow diameter portion 172 of the support shaft 17 of another side is formed for a long time, and the barrel gear 12 is attached in a boss's 21 free end section with the bolt 24. Moreover, the lead-wire insertion hole 174,184 as a support shaft side insertion hole in which lead wire is made to insert is formed in the shaft center of the support shafts 17 and 18, the open section by the side of a way was formed in the minor diameter among the barrels 4 in the lead-wire insertion hole 174,184, and the insertion hole narrow diameter portion 175,185 is formed. When lead wire 7 is made to insert in, the magnitude of this insertion hole narrow diameter portion 175,185 is mostly formed in the diameter of said with lead wire 7 so that the peripheral face of lead wire 7 may stick.

[0014] Lead wire 7 is that by which rubber was covered by the front face and the rod-like cathode lateral electrode (not shown) was attached in the point. Insert lead wire 7 from the receipt opening 131 of a work piece, and it inserts in a cathode lateral electrode and the barrel side insertion hole 231 which prepares the back end section of the opposite side in a bush from the interior of the barrel body 16. After making it insert in the lead-wire insertion hole 174,184 of the support shafts 17 and 18 furthermore, he pulls out to the exterior of a barrel 4 and is trying to make it connect with the anode plate lateral electrode 6 attached in the support plate 1. In addition, the point by the side of cathode is inserted in the barrel 4 interior.

[0015] And it is fixed to the supporter material 3 in the upper part location of a barrel 4, the drive motor and the control device which controls the number of rotations of a drive motor were carried in the case 81, and the driving gear 8 for rotating a barrel 4 is equipped with the electric power switch 91 which turns a drive motor on and off, and the actuation knob 92 which adjusts the number of rotations of a drive motor.

[0016] Furthermore, the transmission 5 which makes the power of a driving gear 8 transmit to a barrel 4 consists of a drive gear 10 of the minor diameter attached in the driving shaft of a drive motor, a middle gear 11 transmitted to the barrel gear 12 which mentions later the turning effort transmitted from the drive gear 10, and a barrel gear 12 attached in one boss section 21 of a barrel 4. And by making a driving gear 8 drive, through the drive gear 10 of a transmission 5, the middle gear 11, and the barrel gear 12, while a barrel 4 is supported by the support shafts 17 and 18, it rotates.

[0017] The procedure which plates using the barrel plating equipment X constituted as mentioned above is explained.

[0018] First, the specified quantity injection of the microchip capacitor of the diameter of about 0.3mm and the about 1mm spherical dummy which consists of electric nonconductors, such as a ceramic which heightens the stirring effectiveness, is carried out as a work piece from the receipt opening 131 of the barrel body 16, and a lid is stopped. Next, barrel plating equipment X is installed in a plating bath so that the about about 2/3 height direction of the barrel body 16 may be soaked in plating liquid. If the electric power switch 91 of a driving gear is turned on, turning effort will be transmitted to the barrel gear 12 through the middle gear 11 from the drive gear 10 of a transmission 5, and the barrel 4 which attached the barrel gear 12 will begin to rotate the perimeter of the support shafts 17 and 18 through a bearing 22. In addition, the actuation knob 92 adjusts the rotational speed of the barrel body.16.

[0019] And after carrying out the predetermined time plating bath of the work piece within the barrel body 16, rotating a barrel 4, barrel plating equipment X is moved from a plating bath to a tank, and is changed, the lid of the barrel body 16 is opened, a work piece is picked out from the receipt opening 131, and a plating process is ended.

[0020] As mentioned above, the barrel plating equipment X of this operation gestalt Holding lead wire 7 as magnitude which sticks the insertion hole narrow diameter portion 175,185 formed in the support shafts 17 and 18 fixed to a support plate 1 to lead wire 7 The magnitude of the barrel side insertion hole 231 by the side of a barrel 4 rather than the insertion hole narrow diameter portion 175,185 in the lead-wire insertion hole 174,184 by the major diameter And since it formed in the slightly larger path than the outer diameter of lead wire 7 so that the inflow of a work piece might be prevented when lead wire 7 was made to insert in, a barrel 4 can be rotated, without a work piece flowing between lead wire 7 and the barrel side insertion hole 231. Therefore, it can prevent that the covering section of the lead wire 7 inserted in the barrel side insertion hole 231 is damaged with a work piece.

[0021] Moreover, since the insertion hole narrow diameter portion 175,185 sticks lead wire 7 and can be held, it can

make location gap insert in few from a shaft center in the barrel side insertion hole 231 which forms lead wire 7 in the body 14 of a side plate of a barrel 4. Therefore, breakage of the covering section of the lead wire 7 by the covering section of lead wire 7 stopping easily being able to contact the internal surface of the barrel side insertion hole 231, and rubbing against the internal surface of the lead-wire insertion hole 174,184 is mitigable.
[0022] Moreover, a bush 23 is formed in the thickness of the body 14 of a side plate, and the thickness of abbreviation identitas. Since the major diameter 171,181 is formed in the posterior part of the narrow diameter portion which is attached in the inside 140 and abbreviation flush of the body 14 of a side plate, and is inserted in the support shafts 17 and 18 at a bearing 22 The barrel 4 supported by the support shafts 17 and 18 shifts to shaft orientations, and the support shafts 17 and 18 do not project inside the barrel body 16. Therefore, without a work piece collecting on one place, since there is no lobe in the barrel body 16 interior, a work piece can be plated to homogeneity and improvement in quality can be aimed at. Moreover, since the maximum reservation of the content volume of the barrel body 16 can be carried out, improvement in the productive efficiency of plating can be aimed at.
[0023] Furthermore, since the bush 23 was formed with the super-high density polyethylene which is excellent in abrasion resistance and lubricity, it is hard to damage covering of lead wire 7. Moreover, since a bush 23 can exchange a bush 23 easily out of a barrel 4, without disassembling the whole equipment, for example also when the path of the barrel side insertion hole 231 is becoming large by wear of a bush 23 since it shall fit in removable from a way side among the barrel bodies 16, its workability is also good.
[0024] In addition, what is necessary is just to make whenever [tilt-angle / of the barrel body 16] into the include angle which can perform best plating according to the class of work piece, or the class of plating liquid, without being limited to this, although the barrel body 16 was attached in the supporter material 3 so that the center line prolonged in the shaft orientations of a barrel 13 may be in the condition that 11 degrees inclined to the horizontal plane in order to perform best plating to the contained work piece in the gestalt of this operation.
[0025] Moreover, hand control not only performs this plating process, but you may perform it by the assembly line by automatic control. For example, a 1st conveyance means to constitute the conveyance path which comes to install two or more long and slender plating baths which can be held, and tanks in the direction of a work flow, and to convey barrel plating equipment X in a plating bath, Plating processing can be performed much more efficiently by establishing the migration means which moves from a plating bath to a tank and is changed, and a 2nd conveyance means to convey barrel plating equipment X in a tank, and carrying out sequential conveyance of two or more barrel plating equipments X.
[0026]
[Effect of the Invention] While having the barrel of the shape of hollow loaded with a work piece, and supporter material equipped with two support shafts and supporting a barrel pivotable to supporter material in the state of both-ends support through two support shafts according to the barrel plating equipment of this invention as mentioned above The barrel side insertion hole for making a barrel insert in the lead wire arranged between a way and the inside of a barrel outside a barrel is formed. It is open for free passage to said barrel side insertion hole, and the support shaft side insertion hole for making the lead wire arranged between a way and the inside of a barrel outside a barrel insert in is formed in a support shaft. While making magnitude of the open section by the side of the method of the inside of a barrel in a support shaft side insertion hole into the magnitude stuck to lead wire and making a barrel side insertion hole counter a support shaft side insertion hole The magnitude of a barrel side insertion hole from the open section by the side of the method of the inside of a barrel container in a support shaft side insertion hole by the major diameter Since it considered as the magnitude which prevents the inflow of a work piece when lead wire was made to insert in a barrel side insertion hole Since a work piece does not enter between the lead wire inserted in a barrel side insertion hole and this barrel side insertion hole, it can prevent that the covering section of the lead wire inserted in a barrel side insertion hole is damaged with a work piece.
[0027] According to invention concerning claim 2, a barrel has a barrel side insertion hole with a barrel. Both-ends opening of said barrel Moreover, a wrap side plate, While having the bearing which is prepared in this side plate and receives a support shaft pivotable and forming the inside of said side plate in a flat surface Since a protrusion inhibition means to prevent that a support shaft projects in the method of the inside of a barrel from the inside of the side plate of a barrel is established between a barrel and a support shaft, there is no lobe in the interior of a barrel, a work piece can be plated to homogeneity, and improvement in quality can be aimed at. Moreover, since the maximum reservation of the content volume of a barrel can be carried out, improvement in the productive efficiency of plating can be aimed at.
[0028] Furthermore, since the side plate of a barrel is equipped with the body of a side plate, and the lead-wire insertion member which has a barrel side insertion hole, is formed with the quality of the material with coefficient of friction smaller than the quality of the material of the body of a side plate, and is attached in the body of a side plate removable

according to invention concerning claim 3, even if the internal surface of a barrel side insertion hole contacts the covering section of lead wire, it is hard to damage the covering section of lead wire. Moreover, when fault arises in a barrel side insertion hole (for example, when lead wire is made to insert in and the path of a barrel side insertion hole is so too large that a work piece enters between a barrel side insertion hole and lead wire), since the fault is canceled only by exchanging a lead-wire insertion member, it is rich in convenience, and cost does not start, either.

[Translation done.]

CLAIMS

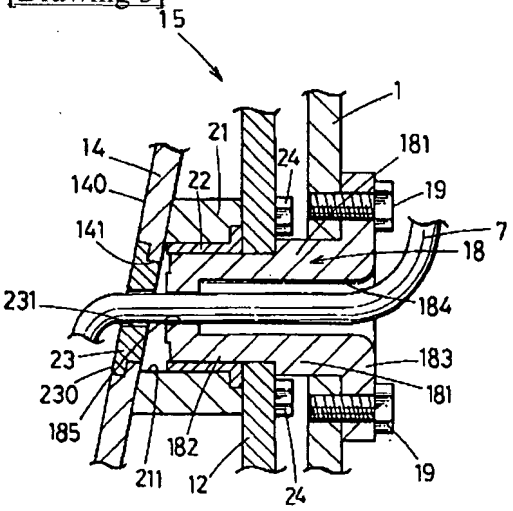
[Claim(s)]
[Claim 1] While having the barrel of the shape of hollow loaded with a work piece, and supporter material equipped with two support shafts and supporting a barrel pivotable to supporter material in the state of both-ends support through two support shafts The barrel side insertion hole for making,a barrel insert in the lead wire arranged between a way and the inside of a barrel outside a barrel is formed. It is open for free passage to said barrel side insertion hole, and the support shaft side insertion hole for making the lead wire arranged between a way and the inside of a barrel outside a barrel insert in is formed in a support shaft. While making magnitude of the open section by the side of the method of the inside of a barrel in a support shaft side insertion hole into the magnitude stuck to lead wire and making a barrel side insertion hole counter a support shaft side insertion hole Barrel plating equipment characterized by considering as the magnitude which prevents the inflow of a work piece from the open section by the side of the method [in / for the magnitude of a barrel side insertion hole / a support shaft side insertion hole] of the inside of a barrel container by the major diameter when lead wire is made to insert in a barrel side insertion hole.
[Claim 2] The barrel-plating equipment according to claim 1 characterized by to establish a protrusion inhibition means prevent that a support shaft projects in the method of the inside of a barrel from the inside of the side plate of a barrel, between a barrel and a support shaft while a barrel is equipped with the barrel and the bearing which it has a barrel side insertion hole, and both-ends opening of said barrel is prepared by a wrap side plate and this side plate, and receives a support shaft pivotable and formed the inside of said side plate in the flat surface.
[Claim 3] Barrel plating equipment according to claim 2 characterized by equipping the side plate of a barrel with the body of a side plate, and the lead-wire insertion member which has a barrel side insertion hole, is formed with the quality of the material with coefficient of friction smaller than the quality of the material of the body of a side plate, and is attached in the body of a side plate removable.

[Translation done.]

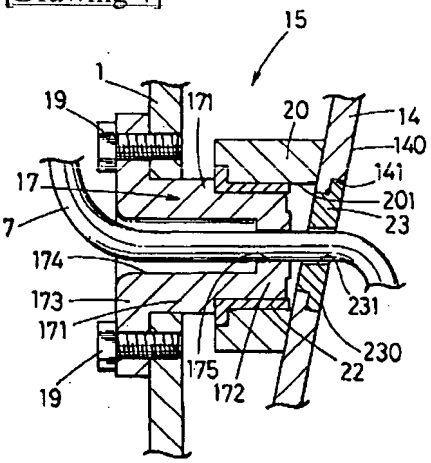
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

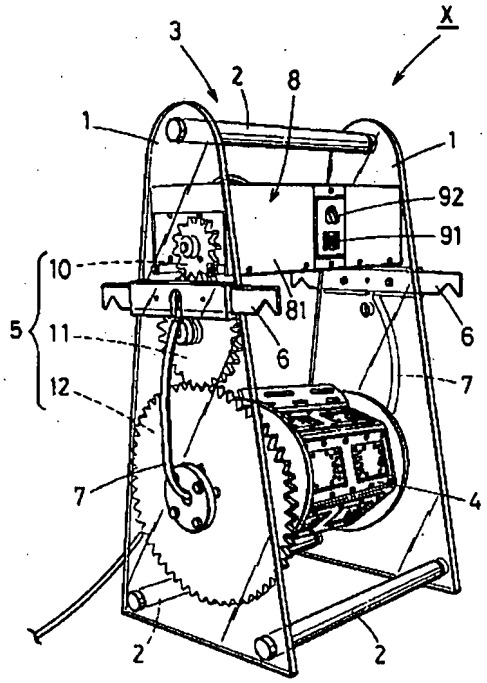
[Drawing 3]



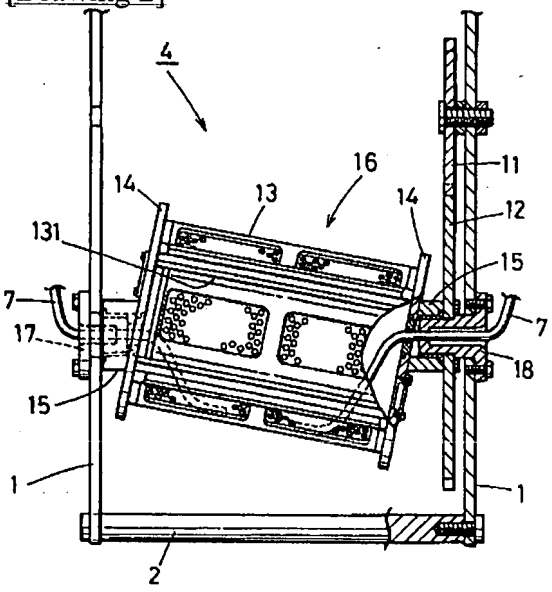
[Drawing 4]



[Drawing 1]



[Drawing 2]



[Drawing 5]